NMFS DRAFT
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Examples of biological metrics for evaluating proposed BDCP actions

Please note: Some of the suggested metrics necessarily invite development of new technologies and sampling programs to achieve the desired understanding and outcome of anadromous fish population responses to BDCP proposed actions.

Objective A: Ensure xx% survival of outmigrant juvenile winter-run, spring-run, fall/late-fall run, steelhead, green and white sturgeon migrating through the Delta, downstream from the:

d. Sacramento River basin
e. San Joaquin River basin
f. Mokelumne system

Example Metrics:

a. An increase (actual number or percent over time) in the number of juvenile anadromous fish of each run/species entering and leaving the Delta compared to xx time period of record or until population growth rate >xx.
b. Unimpeded passage for xx% of each population of downstream migrating fish.
    1. ensure flow ramping rate in flow-augmented habitats that results in < xx incidents of stranded juveniles in floodplains.
    2. <xx% population of fish entering unscreened diversions in Delta
    3. <xx% population of fish entrained at CVP/SWP pumps
    4. no reverse flows in migratory corridors during migratory periods
    5. >xx% population using migratory routes associated with lower mortality risk (e.g., mainstem Sacramento River vs. Georgiana Slough).
c. xx% of each population lost to predation at
    a. barriers, gates, weirs in the Delta
    b. restored habitats (intertidal marshes, channel margins, floodplains, etc.)
d. Suitable water quality along migratory corridors during migratory periods.
    1. > xx °C water temperature
    2. > ppm dissolved oxygen
    3. < ppm nitrates, ammonium, ammonia, phosphorous, etc
    4. < ppm selenium
e. Accessible rearing habitats that allow for successful growth
    a. floodplains
    b. intertidal marshes
    c. channel margins

Example Measurements:

a. Estimate number of fish of each run/species passing through Chipps Island from:
    - I street Bridge (for American River fish) and Verona on Sacramento River)
    - to Vernalis in San Joaquin River
    - to Mokelumne City (or thereabouts) in Mokelumne River
b. Growth rate of juveniles inhabiting floodplains vs. mainstem rivers/sloughs.

c. Primary community structure and biomass with xx % similarity to that in reference habitat conditions in the Delta.
d. Secondary community structure and biomass with xx % similarity to that in reference habitat conditions in the Delta.
e. % likelihood fish use migratory routes associated with higher survival (e.g. % migrating through mainstem Sacramento or Steamboat Slough vs. Georgiana Slough).

Example Methods:

a. Standardized round-the-clock juvenile monitoring at Verona, I-street Bridge, Vernalis, Mokelumne River, Chipps Island, CVP/SWP facilities, etc.
b. Primary and secondary production monitoring at improved and reference habitats.

Objective B: Ensure xx% survival of adult winter-run, spring-run, fall/late-fall run, steelhead, green and white sturgeon migrating through the Delta, upstream to the:

a. Sacramento River basin
b. San Joaquin River basin
c. Mokelumne system

Example Metrics:

a. Unimpeded passage in migratory corridors during xx% of migratory period for each run/species of upstream migrating fish.
    1. ensure magnitude, timing, duration of attraction flows
    2. xx incidents of stranded adults behind weirs, gates, other barriers
    3. xx incidents of falsely attracted adults into the Mokelumne River basin
    4. xx incidents of falsely attracted adults into the San Joaquin River basin
b. Suitable water quality along migratory corridors during migratory periods.
    - > xx °C water temperature
    - > ppm dissolved oxygen
    - < ppm nitrates, ammonium, ammonia, phosphorous, etc
    - < ppm selenium

Example Measurements: Estimate number of fish of each run/species passing through Chipps Island to:

a. I street Bridge (for American River fish) and Verona in Sacramento River
b. to Vernalis in San Joaquin River
c. to Mokelumne City (or thereabouts) in Mokelumne River

Example Methods:

a. Use of tagged fish, didson camera, etc.
b. Call for proposals to develop technology and techniques to track naturally spawned returning Chinook and steelhead at Chipps Island as they migrate upstream in the Sacramento, San Joaquin and Mokelume systems. Build on green sturgeon tracking studies.